APPENDIX A

A QUICK AND CURSORY SUMMARY OF THE CHRISTMAS ISLAND PORTION OF OPERATION DOMINIC 1962

SUMMARY

The Christmas Island portion of Operation Dominic consisted of the firing by air drop of twenty-four nuclear devices to satisfy the large yield weapon development testing needs of the Atomic Energy Commission. Twelve LRL and twelve LASL devices were fired.

The total yield of each device was deduced from fireball diameter vs. time and from bhangmeter data, and the fission yield by radiochemical analysis of bomb debris. The time intervals between stages were measured by electromagnetic and optical detectors. To check on the feasibility of an all-airborne measurement system, fireball cameras, time interval detectors, and distance measuring equipment were also operated from aircraft.

The Department of Defense conducted a number of effects measurements in conjunction with the AEC tests. Eyeburn studies, radar transmission studies, and close-in thermal radiation measurements were among the more prominent.

Weapons put into the stockpile during the test moratorium were tested and operated as designed [redacted]

There was no appreciable fallout detected either on Christmas Island or any of the surrounding islands, and there was no damage from water waves. Damage from thermal radiation was very slight, and blast damage was generally minor, being limited for the most part to broken glass and studding and loosened panels.

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I. INTRODUCTION

During Operation Dominic some twenty-four devices were air dropped over the ocean near the southeast arm of Christmas Island. The main objectives of the tests were:

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APPENDIX B

STARFISH

General Summary of Results

Unfortunately, difficulties in pod stabilization and positioning seriously degraded the acquisition of data on the direct effects of x-rays on materials. Some of the material samples and indenter gauges were subject to the direct x-ray flux and the data are being analyzed; these should yield some useful x-ray effects information.

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5 U.S.C. 552 (b) (3)
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5 U.S.C. 552 (b) (3)
5 U.S.C. 552 (b) (1)
1.3 (a) (6)
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An interesting side effect was that the Royal New Zealand Air Force was aided in antisubmarine maneuvers by the light from the bomb. The next paragraph is an eyewitness report of the detonation by Major C. X. McHugh, who was on Kwajalein; the paragraph following that is an eyewitness report from Johnston Island.

At Kwajalein, 1400 miles to the west, a dense overcast extended the length of the eastern horizon to a height of 5 to 8 degrees. At 0900 GMT, a brilliant white flash burned through the clouds, rapidly changing to an expanding green ball of irradiance extending into the clear sky above the overcast. From its surface extruded great white fingers, resembling cirro-stratus clouds, which rose to 40 degrees above the horizon in sweeping arcs turning downward toward the poles and disappearing in seconds to be replaced by spectacular concentric cirrus-like rings moving out from the blast at tremendous initial velocity, finally stopping when the outermost ring was 50 degrees overhead. They did not disappear, but persisted in a state of frozen stillness. All this occurred, I would judge, within 45 seconds. As the greenish light turned to purple and began to fade at the point of burst, a bright red glow began to develop on the horizon at a direction 50 degrees north of east and simultaneously 50 degrees south of east expanding inward and upward until the whole eastern sky was a dull, burning red semicircle 100 degrees north to south and halfway to the zenith obliterating some of the lesser stars. This condition, interspersed with tremendous white rainbows, (Ed. note: meaning unclear) persisted no less than seven minutes.

At zero time at Johnston, a white flash occurred, but as soon as one could remove his goggles, no intense light was present. A second after shot time, a mottled red disc was observed directly overhead and covered the sky down to about 45 degrees from the zenith. Generally, the red mottled region was more intense on the eastern portions. Along the magnetic north-south line through the burst, a white-yellow streak extended and grew to the north from near zenith. The width of the white-streaked region grew from a few degrees at a few seconds to about 5-10 degrees in 30 seconds. Growth of the auroral region to the north was by addition of new lines developing from west to east. The white-yellow auroral streamers receded upward from the horizon to the north and grew to the south and at about two minutes, the white-yellow bands were still about 10 degrees wide and extended mainly from near zenith to the south. By about two minutes, the red disc region had completed disappearance in the west and was rapidly fading on the eastern portion of the overhead disc. At 400 seconds, essentially all major visible phenomena had disappeared except for possibly some faint red glow along the north-south line and on the horizon to the north. No sounds were heard at Johnston Island that could be definitely attributed to the detonation.

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APPENDIX C

CHECKMATE

General Summary of Results

At Johnston Island, Checkmate observers first saw a green and blue circular region with spikelike protrusions from its outer edge. This region was surrounded by a blood-red ring which faded in less than a minute. Streamers oriented magnetic north-south formed almost immediately and gradually straightened out the initial circular patch. The blue-green streamers and numerous pink striations eventually extended to about a 50-degree elevation to the north and 10 degrees away from the burst to the south. The blue-green streamers faded out at about plus three minutes, leaving pink streamers which gradually faded, but were still visible at plus 30 minutes. A faint red patch was seen for a few minutes to the north, below and beyond the streamers.

At Samoa, observers saw a conical-shaped bright white flash originating some 45 degrees above the horizon and terminating at the southern magnetic conjugate point. The white color faded in a few seconds leaving an orange glow at the conjugate point which then faded completely by about H plus 1 minute.

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DOE, EXEMPTION 1

APPENDIX D

BLUEGILL

General Summary of Results

Observers at Johnston noted a brilliant white flash and a noticeable thermal pulse that was readily felt on the bare skin. At +10 seconds the burst appeared to be a slightly distorted, bright, moonlike-sphere with a clouded inner portion. As the sphere expanded its outer edges resembled a transparent shock wave. Inside was a denser, irregular, luminescent core which first appeared bright yellow and gradually became colored with subdued hues of green, pink, and violet. The central material moved to the surface of the sphere, forming a toroid whose center glowed with a purple fluorescence. Blue-purple streamers formed with the evolution of the toroid, extending about 15-20 degrees from the toroid, north and south along the magnetic field. The streamers, which appeared to come to a focal point in the south and to form a fan toward the north, lasted about three minutes, gradually disappearing. The toroid filled with luminescent wispy material and took on the form of a large, fairly uniform, glowing cloud. At +10 minutes, the cloud was about 120 degrees in diameter and its glow easily permitted resolving the dial of a watch. The cloud glow slowly died away, being still visible at +30 minutes, but no longer apparent by about +1 hour.

From Samoa, observers reported a narrow band whose color changed from bright pink at the northern magnetic horizon to green about 30 degrees above the horizon. The width of the band was about one finger at an arms length (Ed. note: about 1 1/2 degrees), spreading to three fingers, or about 5 degrees, after 3 minutes. The band faded to a dull pink with the green disappearing. By +10 minutes the width was constant at about 5 degrees, but the color had faded. The band was still visible at +20 minutes.

From high-speed photographic records, the following more detailed picture of the fireball and debris motion can be built up.

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The 2,500-foot and 6,000-foot range pods carried aloft on the Thor have been recovered in good condition. The middle pod impacted abnormally and suffered moderate structural damage; its instrumentation was in fair condition. Good tracks were obtained and orientations appear to have been correct on all pods. Quantitative data from the pod experiments are not yet available; however, it appears that the pod experiments on Bluegill were more successful than those on either Starfish or Kingfish.

[redacted]

Monkey and rabbit eyeburn data were obtained in the four C-118 aircraft and on Johnston as part of the DASA retinal burn study. Two inadvertent human eye exposures occurred, resulting in bilateral foveal burns. Neither person suffered any discomfort, but both have lost significant amounts of their central vision. These case histories are being followed by project personnel.

APPENDIX E

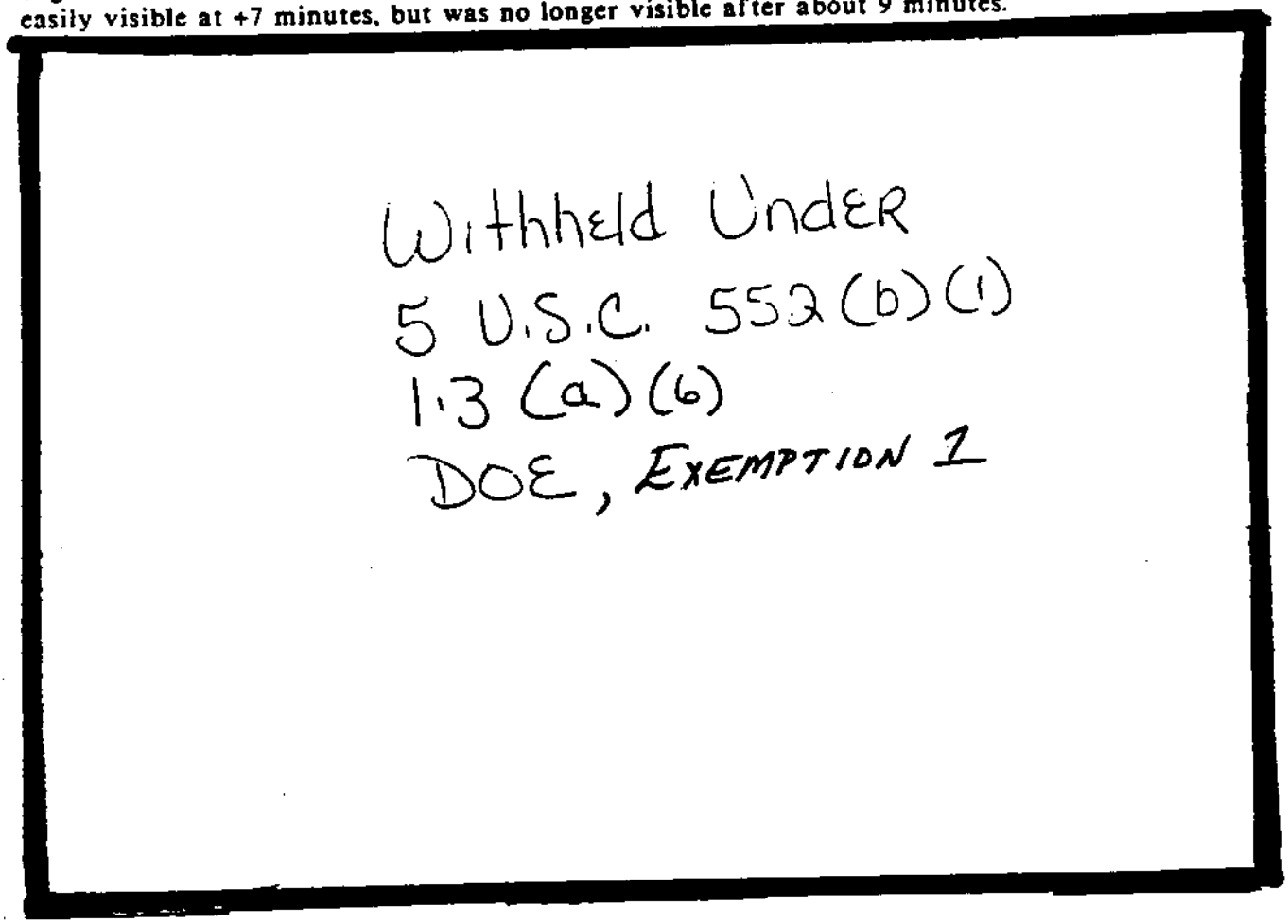
KINGFISH

General Summary of Results

As seen from Johnston Island, a few seconds after burst there was a ring with a nearly transparent outer edge and an inner luminous circular region containing an irregular cloud-like mass. The outer edge quickly disappeared, leaving a luminous white-yellow region. Observers on the ground then saw what appeared to be two nonconcentric, circular areas moving rapidly northward. The two circles seemed identical in size, with one displaced magnetic north of the other. The north edge of the northern circle became increasingly irregular as spikes grew northward from it. At about +60 seconds, intense purple streamers had grown to the north, with several early green streaks. At times, there appeared to be rapid, twisting motion in the

northward purple streamers. A purple glow region about 10 degrees above the northern horizon was separated by about 20 degrees elevation from the purple-green streamers and persisted until +10 minutes. The luminous circular regions straightened out into purplish, magnetic north-south striations by about a minute. To the magnetic south of the burst an oval, pale-green patch appeared early, persisted, and grew. This large pale-green patch south of, but near the burst point, was the dominant visible area after +5 minutes. This green area grew into an elliptical region with the long axis oriented east-west, and appeared to grow westward. At +10 minutes the oval extended about 30 degrees east-west and 20 degrees north-south. At about +20 minutes stars became visible through the green oval region. At +60 minutes the green area had lost its color, but had grown to be 120 degrees east-west and about 80 degrees north-south. At this time most of the light was emanating from areas close to the burst location. The dull gray region persisted for at least 30 hours after burst.

The event was first visible from Oahu as a bright flash of light on the southwest horizon. About 10 seconds later a great white to pink ball appeared to rise slowly out of the sea, preceded by a surrounding ring of red light. As the fireball rose above the horizon it appeared as a white sphere, somewhat egg-shaped, completely surrounded by a well-defined red ring. As it continued to rise the red ring diminished in brightness and the white ball elongated vertically, being asymmetric at the bottom. The cloud stablized at an elevation about 20 degrees above the horizon and flattened out as the red ring disappeared and the cloud faded. Eventually, the debris separated into two platters, one above the other, with their centers canted 15 degrees to the horizon, the lower end to the observers' left. The cloud was still easily visible at +7 minutes, but was no longer visible after about 9 minutes.



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Pod release and pod tracking appear to be satisfactory. The near pod was recovered in excellent condition, and superficial examination indicated that all instruments functioned and recorded data. Pod orientation appeared satisfactory. The middle pod was recovered, with the backplate and major portion of the flare and tracking antenna portion of the nose missing. The indenter gauge on this pod was recovered. The pod appeared to have been within 20 degrees of its desired orientation at burst. The third pod was recovered, but the backplate and almost all experiments were lost.

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5 U.S.C. 552 (b)(3)
DOE, Exemption 3

APPENDIX F

TIGHTROPE

General Summary of Results

On Johnston Island, the Tightrope detonation was accompanied by an intense bright flash. Even with high-density goggles, the fireball was too bright for direct observation during the first few seconds. A distinct prompt thermal pulse was noticable on bare skin. The initial bright yellow-orange disc rapidly evolved into a doughnut shape with purple tinges. By about 60 seconds the torus was well-formed, had sharp edges, and was purple in color. The torus soon became purple throughout. By about 200 seconds, the torus had become crownlike in appearance and had fringes extending outward from the outside edge. The inner edge remained uniform and circular. By 240 seconds, the purple color of the torus became less intense and the slowly deforming torus was cloudlike in appearance. In a few minutes the residue appeared as a glowing purple cloud that was still faintly visible at +10 minutes. The cloud slowly moved north until it was no longer visible.

From Hawaii, a short sharp flash of white light was visible on the horizon, lasting less than 2 seconds. No other evidence of the detonation was detectable.

No observable effects were seen at Tutuila, although the weather was reported clear.

The experimental effort on the Tightrope event was greatly reduced from that on previous high-altitude events. The lower altitude of the detonation, as predicted,

did not provide the widespread disturbances and effects seen in earlier Dominic events.

In general, the phenomena noted and the effects measured were in accord with predictions. Visible effects were confined generally to the Johnston Island danger area, some 320 miles in diameter.

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